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(54) A rotor with permanent magnets for an electrical machine

(57) A rotor for an electrical machine with radially oriented permanent magnets (6) between which pole terminals (4) are arranged, in which rotor the radial axes (1) of arcuate surfaces (2) of the pole terminals are arranged between the radial axes (3) of the cores of the pole terminals themselves and the raidal axes (5) of the magnets. Each of the surfaces partially and unilaterally overlapping an adjacent one of the magnets. The longitudinal axes (8) of the arcuate pole terminal surfaces form discontinuous lines while the longitudinal axes (9 and 10) of the pole terminal cores and the magnets form continous lines.

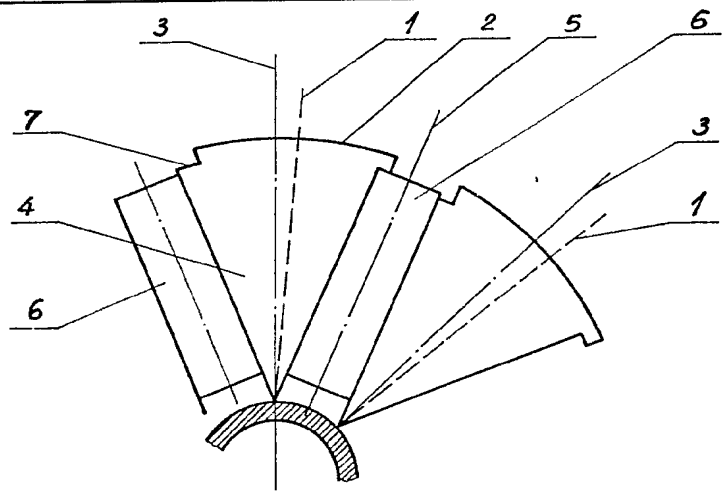

Fig. 1

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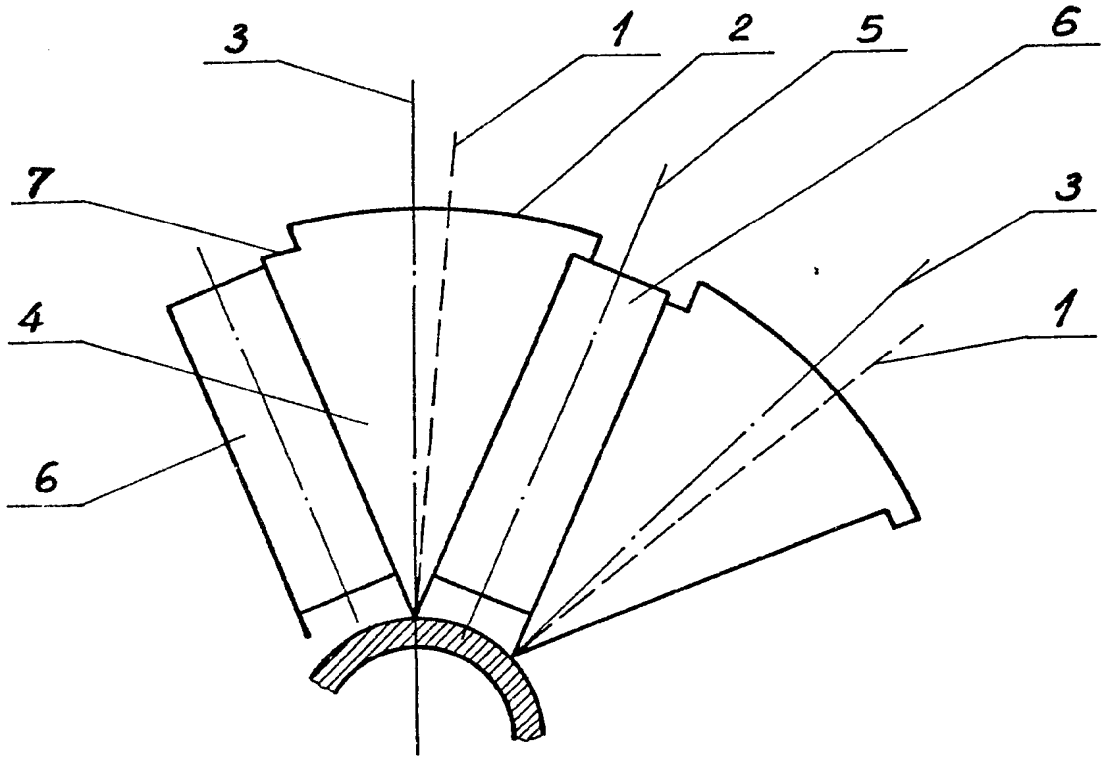

Fig. 1

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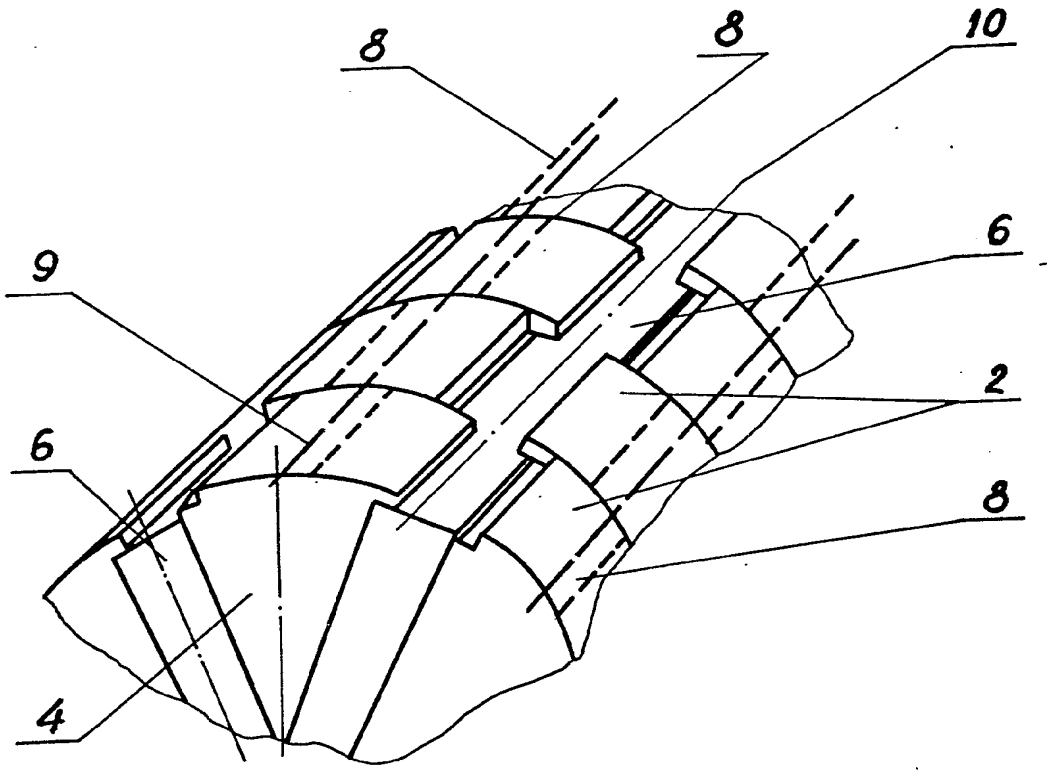

Fig. 2

SPECIFICATION

A rotor with permanent magnets for an electrical machine

The present invention relates to a rotor with permanent magnets for an electrical machine.

It is known to provide a rotor with tangentially oriented permanent magnets and pole terminals arranged between them. The magnets are radially secured by means of non- magnetic cotters (pins or wedges) driven into grooves provided in the upper parts of the lateral surfaces of the pole terminals. The disadvantage of such a construction is that it is impossible to ensure a value for the distance between adjacent pole terminals greater than the tangential dimension of the magnet without reducing the radial dimension of the magnet. This results in a reduction of the density co-efficient of the magnetic flux, i.e. a reduction of the effective magnetic flux in the gap.

In another rotor with tangentially oriented magnets and pole terminals arranged between them, the pole terminals are provided with small rims under which are placed T- clamps which tighten the rims and radially secure the magnets. The disadvantage of such a construction is that an increase of the distance between adjacent pole terminals greater than the tangential dimension of the magnet results in a considerable dissipation of magnetic flux in the gap between the pole terminals, which hampers the commutation of the machine. The construction does not make it possible for the longitudinal axes of the arcuate pole terminal surfaces to be staggered, forming discontinuous lines, which is necessary for reducing uneven rotation of the machine.

It is also known to provide a rotor comprising modular packs, each consisting of pole terminals, whose inside ends are founded in a sleeve of non-magnetic material, and tangentially oriented permanent magnets mounted in semi-closed grooves formed by the terminals. The modular packs can be arranged in such a way as to make it possible for the longitudinal axes of the arcuate pole terminal surfaces to form discontinuous lines. However, the shortcoming of this construction is that, in this case, the longitudinal axes of the magnets also form discontinuous lines which leads to an increase of the dissipation of the flux of the magnets.

According to the present invention, there is provided a rotor for an electrical machine, the rotor having permanent magnets which are tangentially arranged with pole terminals placed between the magnets, in which rotor the radial axes of arcuate pole terminal surfaces of the pole terminals are arranged between the radial axes of the cores of the pole terminals themselves and the radial axes of the magnets, each of the said arcuate pole terminal surfaces partially and unilaterally overlapping an adjacent one of the magnets.

The present invention enables the advantages that it may be ensured that the arcuate pole terminal surfaces may be of any size without substantially affecting the radial dimensions of the magnets and substantially without giving rise to a considerable dissipation of flux in the gaps between the pole terminals. By having adjacent pole terminals in the longitudinal direction overlapping adjacent magnets on opposite sides of the terminals in an alternating fashion, it is possible to obtain a staggering of the longitudinal axes of the arcuate pole terminal surfaces yet to have the axes of the magnets and cores of the pole terminals themselves in continuous lines. This can result in a decreased unevenness of rotation of the machine without substantially causing an increase of the dissipation of flux of the magnets.

The present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows an embodiment of a rotor for an electrical machine; and

Figure 2 shows an embodiment of such a rotor with arcuate pole terminal surfaces having longitudinal axes which form discontinuous lines.

Referring to Fig. 1, the radial axes 1 of arcuate pole terminal surfaces 2 are between radial axes 3 of the cores of the pole terminals 4 themselves and radial axes 5 of permanent magnets 6 which are mechanically secured in the radial direction. Each surface 2 partially and unilaterally overlaps an adjacent one of the magnets 6. With a view to reducing the dissipation of magnetic flux in the gaps between the pole terminals, each terminal has a radial cut 7 in its upper section beyond the surface 2.

Referring to Fig. 2, the longitudinal axes 8 of successive arcuate pole terminal surfaces 2 are staggered, forming discontinuous lines, while the longitudinal axes 9 and 10 of the cores of the pole terminals 4 and of the magnets 6 respectively form straight continuous lines.

Due to the fact that in a rotor with tangentially directed permanent magnets and pole terminals between them, the radial axes of the arcuate pole terminal surfaces are arranged between the radial axes of the pole terminal cores and magnets, and that each of the arcuate pole terminal surfaces partially and unilaterally overlaps an adjacent magnet, the choice of length for the arcuate pole terminal surface does not affect substantially the radial dimensions of the magnets, i.e. it substantially does not cause a drop of the magnetic flux. If the longitudinal axes of successive arcuate pole terminal surfaces form discontinuous lines while the longitudinal axes of the cores of the pole terminals and the magnets are straight, continuous line, this reduces the unevenness of rotation of the machine.

CLAIMS

1. A rotor for an electrical machine, the rotor having permanent magnets which are tangentially arranged with pole terminals placed between the magnets, in which rotor the radial axes of arcuate pole terminal surfaces of the pole terminals are arranged between the radial axes of the cores of the pole terminals themselves and the radial axes of

the magnets, each of the said arcuate pole terminal surfaces partially and unilaterally overlapping an adjacent one of magnets.

2. A rotor according to claim 1 wherein longitudinal axes of the arcuate pole terminal surfaces form discontinuous lines while the longitudinal axes of the cores of the pole terminals and the longitudinal axes of the magnets form straight continuous lines.

3. A rotor for an electrical machine, substantially as herein described with reference to Fig. 1 or Figs. 1 and 2 of the accompanying drawings.

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